Aug. 16, 1966 R. E. STEWART ETAL 3,267,234

DUAL ACTION MAGNETIC SWITCH

Filed Feb. 1, 1965 2 Sheets-Sheet 1

FIG. 1

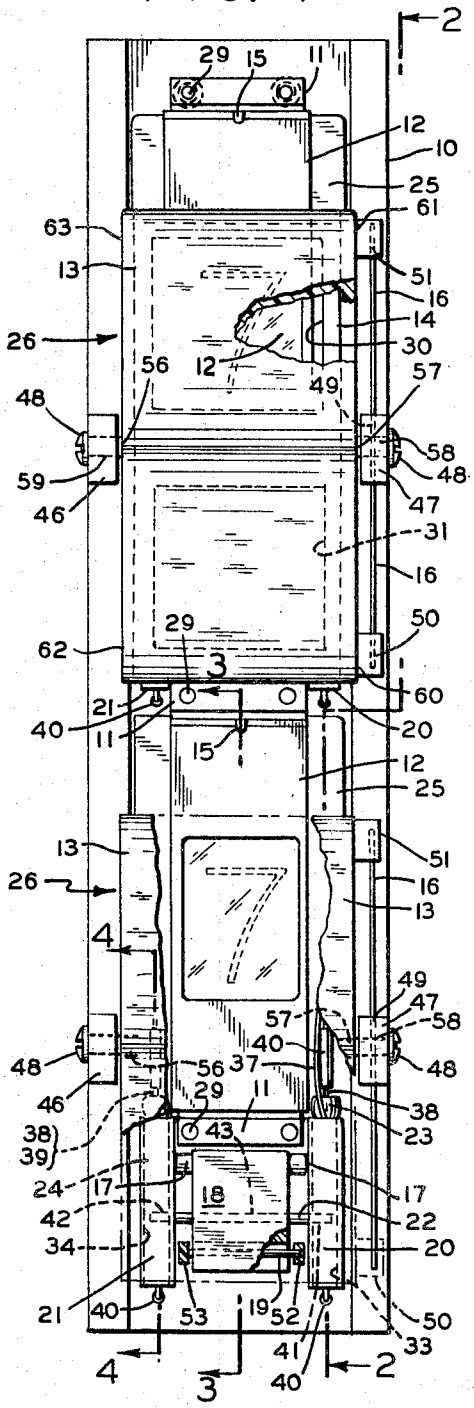
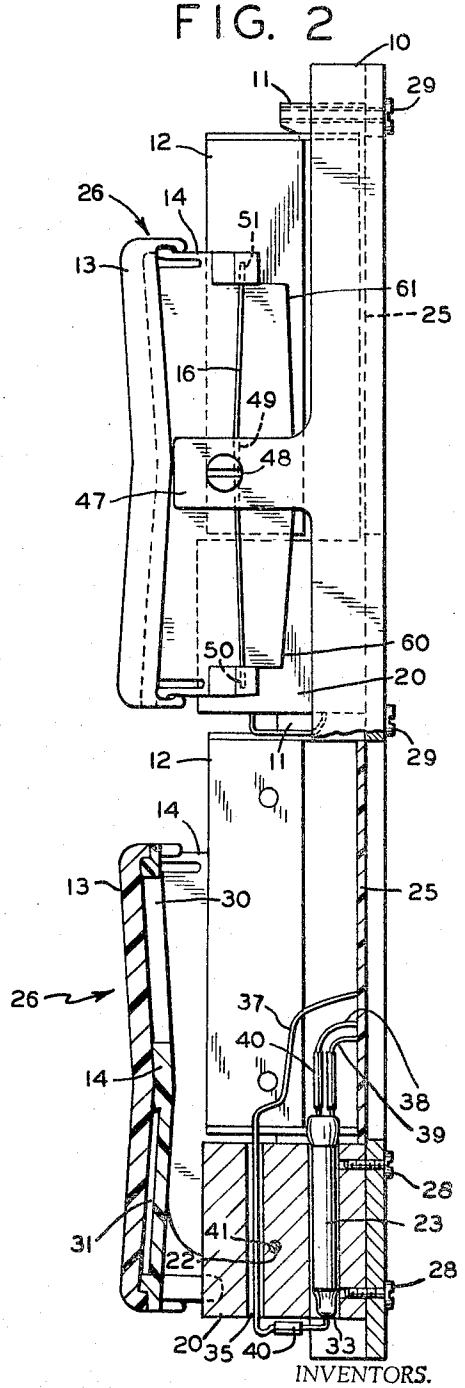


FIG. 2



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Filed Feb. 1, 1965 2 Sheets-Sheet 2

FIG. 3

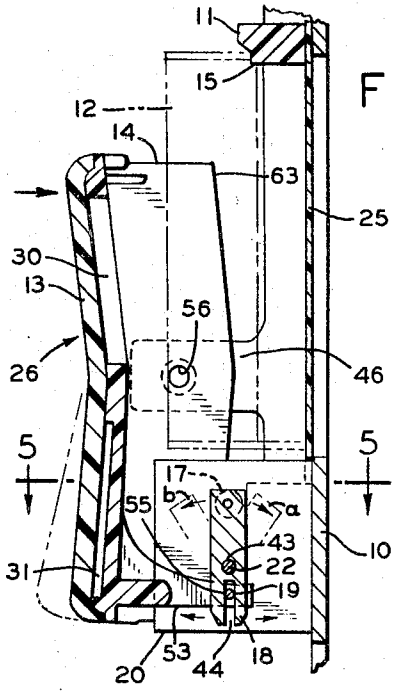


FIG. 4

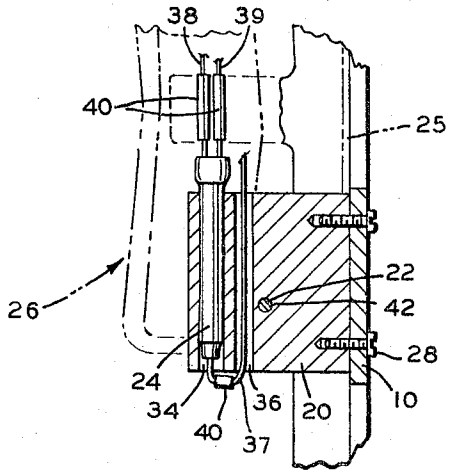
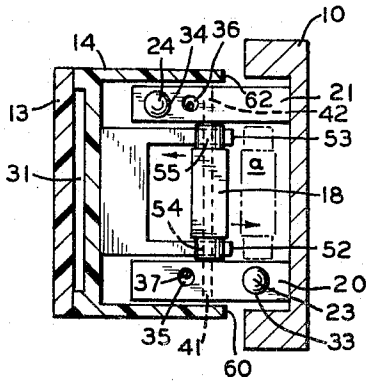


FIG. 5



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DUAL ACTION MAGNETIC SWITCH

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3 Claims. (Cl. 200—87)

This invention relates to magnetically actuated switches and more particularly to a dual action rocker arrangement which operates one of a pair of magnetically operated reed switches by pressing at one end of the switch actuator and a second reed switch by pressing at the other end of the actuator. This result is effected when the actuator moves a permanent magnet in alternate directions near the first or second reed. By thus varying the proximity of a source of magnetic flux, generated by the permanent magnet, the leaf or reed of the reed switch which is contiguous to the magnet and has its contact normally biased in one position, changes its electrical contact position.

It is an object of the invention to provide a novel dual action rocker switching device which employs magnetically actuated reed switches.

It is a further object of the invention to provide a dual action device, incorporating magnetic reed switches, adapted for use in conjunction with an illuminated read-out indicator.

It is another object of the invention to provide bi-directional or a dual action switch wherein pressing on one end of the switch actuator actuates at least one switch and pressing on the other end actuates at least one other switch.

Another important object is to provide a dual action panel-mounted rocker switch with an illuminated read-out wherein depressing one end of the switch actuator counts or adds the number entered and depressing the opposite end of the switch provides a subtracting function.

Another object is to provide a dual action or rocker switch which is retained in a neutral position and may be depressed so as to actuate one of two alternate reed switches.

Another object is to provide in a switch device of the kind described, a novel, simple and dependable construction having rapid assembly and disassembly characteristics.

The foregoing and additional objects of the invention will become apparent from the following detailed specification taken together, with the drawing in which:

FIG. 1 is a plan view of a pair of switches showing one of the pair as partially in section.

FIG. 2 is a side elevational view taken on lines 2—2 of FIG. 1.

FIG. 3 is a sectional view taken on line 3—3 of FIG. 1.

FIG. 4 is a fragmentary sectional view taken along line 4—4 of FIG. 1.

FIG. 5 is a transverse sectional view taken on the diagonal line 5—5 of FIG. 3.

Briefly, the invention comprises a switch having bi-directional pivotable actuation which is retained in a neutral position and may be rocked or pivoted by pressing at one or the other end thereby actuating independent switches. The switch may accommodate a read-out device whose illuminated indicator is visible through the switch actuator. The actuator is also advantageously

adapted for receiving and removably retaining a suitable label to designate the function of the switch. As an entity, the switch of the invention provides an extremely compact and versatile unit which is readily adaptable for mounting compactly in banks on panels containing a substantial number of such switches.

Referring to the drawing, the assembly comprises an actuator or key support housing or base **10** which is formed of any suitable material preferably metal, e.g., aluminum. In the embodiment illustrated the base **10** is appropriately contoured to receive guide elements **11**, read-out device **12** which fits within said guide elements and read-out printed circuit board assembly **25**. Mounting screws **29** or any comparable appropriate means may be used to secure elements **11** and the circuit board to the base **10**.

The read-out device **12** is connected in a conventional manner into the printed circuit board **25** as by plugging it in while being guided into appropriate location by the spaced guide elements **11**. To assure accurate alignment of read-out **12** in guides **11**, a suitable tongue **15** may be formed in elements **11** to mate with a corresponding groove in read-out **12**. Read-out devices which may be employed and which, as such, form no part of the present invention, are such as those available commercially as Model 4W from Non-Linear Systems, Inc., of Del Mar, California, and comprise a low voltage digital read-out.

Also mounted on base **10** as by screws **28**, are left and right reed support blocks **20** and **21**. Preferably, blocks **20** and **21** prior to mounting already house therein, in appropriate formed recesses **33** and **34**, reeds **23** and **24**, respectively. Also formed in support blocks **20** and **21** are reed switch common contact terminal return holes or openings **35** and **36** through which leads **37** are passed. Reeds **23** and **24** are electrically connected to the printed circuit board assembly **25** by leads **37**, **38** and **39** by connectors **40**.

Illustrated at **18** is a pivotable lever block. A permanent magnet **17** is appropriately fitted into the magnet lever block **18** and is movable, in reciprocating motion therein, contiguous to one or the other of reed switches **23** and **24**. The lever block **18** is fitted between the parallel spaced reed blocks **20** and **21**, being secured thereto in pivoting relationship by pin **22**. Pivot pin **22** passes through a hole **43** in block **18** and through holes **41** and **42**, respectively, formed in blocks **20** and **21**. Pin **22** is confined against removal as hereinafter described when the switch is assembled. While a permanent magnet is preferred as the source of flux to move the switch contacts it is apparent that alternate sources such as coil of wire through which current flows may be used. When a coil is used, it will be apparent that current thereto may be controlled from a position remote to the device of the invention, thereby offering a remote lock-out whereby depressing key **14** would have no effect on the switch contacts unless current was flowing in the coil.

The magnet lever **18** is provided with an actuator slot **44**. The switch actuator (or rocker key) assembly **26** is appropriately mounted pivotally on and between the left and right uprights **46** and **47**, respectively, of base **10**. The assembly **26** includes an actuator rocker main portion **14**, of any suitable composition, but preferably plastic, which is mounted by screws **48** for rocking or seesaw motion on uprights **46** and **47** which are preferably integrally formed with base **10**.

The base or main portion of the actuator **14** is formed so as to have an opening or window **30** to permit viewing

the illuminated digit from the read-out **12**. Key base **14** is provided also with a legend cavity **31** which may be molded integrally with element **14** to include label retaining cams or slots (not shown) of conventional configuration which allow a label to be readily inserted and held therein. Fitted over the key **14**, preferably in a snap-in relationship, is a transparent cover **13**. Extending in a direction perpendicular to the switch actuator pivot axis in at least one of the casting uprights **46** or **47** is a wire spring **16** which functions through the spring action of the wire to retain assembly **26** in a neutral position and to return it to neutral position after it has been pivoted by depressing one or the other end of the assembly **26**. Spring **16** as shown in FIG. 2 is held in a manner tending to hold it in a direction parallel to the axis of the base **10** and resists movement by passing it into a close fitting hole **49** transversely extending through the upright **47**. Spring **16** is retained against removal, i.e., sliding in one or the other direction, when the assembly **26** is in place, by having its ends retained in slotted cavities **50** and **51**, appropriately formed in actuator base **14**.

As shown more clearly in FIG. 5, the actuator base **14** is provided with spaced depending legs **52** and **53** in which are suitably formed holes **54** and **55**, respectively. To effect pivoting of block **18**, the terminals of a wire or pin **19** are positioned in holes **54** and **55** and wire **19** is inserted in slot **44** of lever block **18** which is fitted between depending legs **52** and **53** of the main portion **14** of the actuator. Operable distancing of the magnet **17** out of the influence of the contacts of switches **23** and **24** when the key **26** is in neutral position while allowing optimum movement of the magnet near one or the other of switches **23** or **24** is obtained by suitable spacing of pins **19** and **22**.

It will be noted that when the lever block is in neutral position the lever block **18** is positioned intermediate reed switches **23** and **24** and the field of flux from magnet **17** is beyond the distance effective to alter the contacts of reed switches **23** and **24**. In other words, considering a horizontal plane drawn through the pivot axis of the lever **18** and axis of magnet **17** when the magnet is in neutral position, the reed switches are situated in essentially equidistant parallel planes on either side of the first plane.

In assembling the actuator assembly **26** on the uprights **46** and **47** of the base, the assembly **26** is positioned initially by inserting the wire or pin **19** in slot **44** of lever **18** as the slot faces in an upward direction. Thereafter the key assembly **26** is moved backward thereby pivoting the upward facing lever slot of magnet lever **18** downward and positioning the key assembly **26** so that holes **56** and **57**, formed in the sides of actuator **14** are aligned with openings **58** and **59** formed in base uprights **46** and **47**. Threaded holes **58** and **59** in uprights **46** and **47** for screws **48** retain the actuator in operable relationship. When the assembly **26** is aligned it is seen that the ends of the wire spring **16** are confined against removal in cavities **50** and **51** formed on each end of the key base **14**; the magnet lever pin **19** housed in slot **44** is retained against removal by the inner walls of blocks **20** and **21**; and pivot pin **22** housed in support blocks **20** and **21** to hold pivot lever **18** is confined or retained by the inner face of vertically depending walls **60** and **62** of key base **14**. As shown, the bottom limit of walls **60**, **61**, **62** and **63** of actuator **14** are designed so as to provide a limiting stop for the rocker travel as the wall limits **60** or **61** engage base **10** which acts as the limiting stop, see FIGS. 2 and 5.

In operation of the switch of the invention, it is seen that by pressing key assembly **26** at either end, the key will pivot around the pivot axis at screw **48**. Magnet lever **18**, linked through magnet lever pin **19**, will pivot on magnet lever pivot pin **22**, moving magnet **17** in either up or down direction, thereby actuating reed switch **24** or **23** as the magnetic flux density is brought contiguous thereto, respectively. Referring to FIGS. 3 and 5, when the upper side of actuator assembly **26** is depressed, the magnet **17** is moved to position "*a*" and contacts of reed switch **23** are altered by the increased flux density from the magnet; when the lower side of assembly **26** is depressed, the magnet is moved to position "*b*" and contacts of reed switch **24** are altered by the transposed flux density from the magnet brought contiguous thereto. At rest, wire spring **16** will keep key assembly **26** in neutral position.

To insure the required pull-in and drop-out distance of magnetic reeds and to keep the magnet lever **18** travel to a minimum, the magnet **17** travel was amplified by a factor of about two by suitably positioning the distances between pivot pin **22** and actuating pin **19**, i.e., for a given movement of a distance *x* by pin **19**, the magnet **17** will be moved a distance of about two *x*. By means of the associated electronics and the actuation of the key, the read-out device **12** mounted on printed circuit board **25** will light up a digit, visible through window **30**.

The switch has varied useful applications which will be apparent to those skilled in the art. For example, it may be used in conjunction with a bi-directional ring counter such as that disclosed in the pending application of M. Felcheck, Serial No. 197,662, filed April 25, 1962. When used in this manner the switch of the invention can be used in combination with an electronic bi-directional ring counter as the key device to initiate an electronic ordering and billing system as disclosed in the system of pending application of N. Alpert et al., S.N. 219,222 filed August 24, 1962, entitled, "Electronic Ordering, Price Computing and Billing System." When so used a bank of switches of this kind can be used, one for each item on the menu. As items are ordered, the key is actuated by pressing the lower half of the switch counting up the desired number of items. In the event of an error, the upper half of the switch may be depressed to subtract from the number of items added previously when the lower half of the switch was depressed.

While a specific embodiment of the invention has been shown and described, it will be understood that various modifications, alterations or substitutions may be made to the disclosure presented without departing from the intent and scope of the invention defined by the appended claims.

What is claimed is:

1. A magnetically actuated push type switch comprising a switch housing support, a bi-directional switch actuator pivotally mounted on said support and capable of bi-directional movement from a neutral position, means tending to hold said actuator in a neutral position, and to return it to the neutral position after it has been depressed and released, a first magnetically responsive reed switch, a second magnetically responsive reed switch spaced from said first switch, and a magnet connected to said actuator and positioned between said switches, and pivoted by movement of said actuator when one or the other end of said actuator is depressed, said magnet when in a neutral position being located so as not to influence the contacts of the reed switches when said actuator is in the neutral position, and so as to alter the contacts of one of the spaced switches as the magnet is pivoted contiguous to one of the switches by correspondingly depressing said actuator.

2. A magnetically actuated push type switch comprising a switch housing support, a bi-directional switch actuator pivotally mounted on said support and capable of bi-directional movement from a neutral position, means tending to hold said actuator in a neutral position, and to return it to the neutral position after it has been depressed and released, a first magnetically responsive reed switch, a second magnetically responsive reed switch spaced from said first switch, a pivotal lever engaged by and reciprocated by said actuator mounted between said switches, and a permanent magnet mounted on and pivotal with

said lever, said lever being connected to and pivotable in opposite directions corresponding to movement of said actuator when said actuator is depressed, said magnet being located in a parallel intermediate plane between parallel planes passing through the axes of said spaced reed switches and so as not to influence the reed switch contacts as said actuator is in the neutral position, and so as to alter the reed switch contacts, respectively, as the magnetic flux density is brought contiguous to the contacts of one of said spaced switches by correspondingly depressing said actuator.

3. The device of claim 1 in combination wherein said read-out is positioned below said actuator and said actuator comprises a transparent portion through which said illuminated read-out is visible and with an illuminated digital read-out wherein depressing the actuator at one end provides a total in the numerical read-out and depressing the actuator at the opposite end subtracts and provides a remainder in said read-out.

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